PBEEEP
State Government

Public Buildings Enhanced Energy Efficiency Program

SCREENING RESULTS FOR MINNESOTA WEST COMMUNITY AND TECHNICAL COLLEGE- JACKSON CAMPUS

Minnesota West
COMMUNITY & TECHNICAL COLLEGE

Minnesota
STATE COLLEGES
& UNIVERSITIES

June 17, 2011

Campus Overview

Minnesota West Community and Technical College- Jackson Campus	
Location	401 West Street, Jackson, MN 56143
Facility Manager	Gordon Heitkcamp Building Maintenance Foreman
Number of Buildings	1
Interior Square Footage	102,050 square feet (from B3)
PBEEEP Provider	Center for Energy and Environment (Angela Vreeland)
Date Visited	4/21/2011
Annual Energy Cost	$105,493 (from 2010 utility data)
Utility Company	Electric: City of Jackson Natural Gas: Minnesota Energy Resources
Site Energy Use Index (EUI)	90 kBtu/sqft (from 2010 utility data)
Benchmark EUI (from B3)	86 kBtu/sqft

Minnesota West Community and Technical College in Jackson is comprised of one main building, which has had six additions since it was originally built in 1964. There is a lineman shop, daycare, auto body, and special needs area. A map of the campus can be found at the end of this report.

Screening Overview

The goal of screening is to select buildings where an in-depth energy investigation can be performed to identify energy savings opportunities that will generate savings with a relatively short (1 to 5 years) and certain payback. The screening of Minnesota West Community and Technical College in Jackson was performed by the Center for Energy and Environment (CEE) with the assistance of the facility staff. A walk-through was conducted on April 21, 2011 and interviews with the facility staff were carried out to fully explore the status of the energy consuming equipment and their potential for recommissioning. This report is the result of that information.

Recommendation

An investigation of the energy usage and energy savings opportunities of the campus is not recommended at this time. The table below lists the buildings located on campus, which are essentially one building that has had six additions since originally built. The floor areas listed in the table have not been verified.

Building Name	State ID	Building	Area (sq ft)	Year Built
Auto Body	E26255T0578	Main	1,880	1978
Day Care	E26255T0889	Main	2,850	1989
Lineman Shop	E26255T0978	Main	4,480	1980
Main	E26255T0164	Main	22,080	1964
Main Addition 1	E26255T0266	Main	8,000	1966
Main Addition 2	E26255T0474	Main	57,000	1974
Special Needs	E26255T0783	Main	5760	1983

There are many factors that are part of the decision to recommend an energy investigation of a building; at Minnesota West Jackson some of the characteristics that would indicate the campus is a good candidate for recommissioning are:

- Level of control by the building automation system
- Equipment size and quantity
- Support from the staff and management to include building in an investigation

Although the building staff are clearly supportive of an energy investigation and would like to further reduce energy use at their campus, the energy use at the site is simply too low for a recommissioning study to be certain of delivering cost- effective savings. Recommissioning is focused on low-cost and no-cost measures that typically involve control changes and other minor adjustments to equipment operation. The Energy Use Index (EUI) for the campus is 90 kBtu/sqft. This is a low EUI and indicates that the staff has already identified the majority of short payback items. Therefore, the likelihood of finding energy efficiency measures for the Main Building that will be cost effective is unlikely.

Potential Energy Reduction Measures and Existing Problems

It appeared that several sensors used by the building automation system were out of calibration and could be repaired or replaced. Some of the setpoints used for controlling the building could be optimized by the staff.

There are two separate heating loops and while there might be a benefit to tying them together this is a capital cost item is not likely to meet the payback goals of the program.

Building Descriptions

Details about the campus obtained through the screening process are included in the following:

Mechanical Equipment

There are a total of 2 air handlers and seven rooftop units located throughout the building. Most of the air handlers are variable air volume (VAV). There are 10 VAV boxes, none of which have hot water reheat. All of the rooftop units were replaced in 2004-2005. There are seven heating ventilators, which are basically small air handlers that are manually operated.

There are four low pressure steam boilers that produce 9-10 psi steam during the fall, winter, and spring. Two of the boilers are located in the 1964 building and two are in the 1974 building. All of the 1964 building is steam while much of the rest of the campus has been converted to hot water.

There are no chillers on campus, as cooling is provided by DX cooling within the air handlers and rooftop units.

The following table lists the key mechanical equipment in the building.

Mechanical Equipment Summary Table	
1	Building Automation System (Johnson Controls Metasys)
1	Buildings
102,050	Interior Square Feet
2	Air Handlers
7	Rooftop Units
10	VAV Boxes
3	Cabinet Unit Heaters
4	Low Pressure Steam Boilers
3	Pumps (HW, CHW, etc)
2	Heat Exchangers

Controls and Trending

The mechanical equipment is controlled by a Johnson Controls Metasys Building Automation System (BAS), which was installed in 2003. The system is capable of trending and the trend data can be exported from the BAS in a usable format for spreadsheet analysis. The majority of the equipment on campus is digitally controlled and on the automation system.

Lighting
The majority of interior lighting on campus is 32 watt T8s and as the lamps burn out they are being replaced with 28 watt T8s. Most of the 1974 building and some of the classrooms have occupancy sensors and the rest of the lights are on manual switches.

Energy Use Index and B3 Benchmark
The site Energy Use Index (EUI) for the campus is 90 kBtu/sqft. This is 4% higher than the B3 Benchmark of 86 kBtu/sqft. The median site EUI for State of Minnesota buildings are 23% lower than their corresponding B3 Benchmarks. Although the site is lower than its benchmark, an EUI of 90 kBtu/sqft is considered low and no significant opportunities for improved operation were noted in the screening visit.

Metering
The building has four electric and two natural gas meters.

Documentation
There is a significant amount of mechanical documentation, including building plans, equipment schedules, and balancing reports available on-site. There is a balancing report from 2006 when nearly all the air handlers were balanced, which was shortly after they were all replaced.

Building Summary Tables

The following tables are based on information gathered from interviews with facility staff, building walk-throughs, automation system screen-captures, and equipment documentation. The purpose of these tables is to provide the size and quantity of equipment and the level of control present in each building. It is complete and accurate to the best of our knowledge.

Main
State ID# E2655T0578, E26255T0889, E26255T0978, E26255T0164, E26255T0266, E26255T0474, E26255T0783

Area (sqft)	102,050	Year Built	1964-1989	Occupancy (hrs/yr)	2,080

HVAC Equipment

Air Handlers (2 Total)

Description	Type	Size	Notes
1964 Bldg AHU	Dual Duct CV AHU with SF	7,550 cfm	
1966 Bldg AHU	Dual Duct CV AHU	14,500 cfm	

Rooftop Units (7 Total)

Description	Type	Size	Notes
RTU 1	VAV Rooftop Unit	8,484 cfm, 10 hp SF, 7.5 hp RF	
RTU 2	VAV Rooftop Unit	10,915 cfm, 15 hp SF, 7.5 hp RF	
RTU 3	VAV Rooftop Unit	11,834 cfm, 15 hp SF, 10 hp RF	
RTU 4	VAV Rooftop Unit	11,760 cfm, 15 hp SF, 7.5 hp RF	
RTU 5	VAV Rooftop Unit	9,189 cfm, 10 hp SF, 5 hp RF	
Daycare/ Cosmo RTU	Constant Volume Rooftop Unit	3,200 cfm	
1985 Add RTU	VAV Rooftop Unit	6,174 cfm, 5 hp SF, 1.5 hp RF	Serves 10 VAV boxes

VAV Boxes (10 Total)

Description	Type	Size	Notes
VAV 1-10	Terminal	152-1,350 cfm	Served by 1985 Add. RTU, no reheat

Heating Ventilators (7 Total)

Description	Type	Size	Notes
HV1-7	Heating Ventilators	4,600 – 6,600 cfm each	Located in the 1966 Building Addition

HVAC Equipment Cont'd

Heating System (1964 Building)

Description	Type	Size	Notes
Boiler 1	Steam Boiler	4,500 MBH	9-10 psi steam, located in 1964 Boiler Room
Boiler 2	Steam Boiler	4,494 MBH	9-10 psi steam, located in 1964 Boiler Room

Heating System (1974 Building)

Description	Type	Size	Notes
Boiler 1 Boiler 2	Steam Boiler	5,537 MBH	9-10 psi steam, located in 1974 Boiler Room
Converter 1	Steam to HW Converter		Produces HW for reheats in Front Offices
Pump 1 Pump 1A	HW Pumps	2 hp each	Circulates HW for reheats in Front Offices

Heating System (1985 Building)

Description	Type	Size	Notes
Converter 2	Steam to HW Converter		Produces HW for 1985 Cosmo/Daycare Addition
Pump 2	HW Pump	3/4 hp	Circulates HW for 1985 Cosmo/Daycare Addition

Cabinet Unit Heaters (3 Total)

Description	Type	Size	Notes
CUH 1-3	Cabinet Unit Heater	200 cfm each, 1/20 hp each	

Points on BAS

Air Handlers

Description	Points
1964 Bldg AHU	CDT, Coldest zone temp, HDT, MAT, Warmest zone temp, R103 room temp, Econ damper, Heating valve, OA min position, SF status, Cooling stage 1, Occ/Unocc
1966 Bldg AHU	OAT, G209 room temp, Coldest zone temp, Warmest zone temp, RA CO2, Econ damper, MAT, Cooling stage 1, Cooling stage 2, Cooling stage 3, CDT setpoint, CDT, Heating valve, HDT, HDT setpoint, Heating OA setpoint, RA CO2 setpoint, SF status, Occ/Unocc, OA min position, Cooling OA setpoint, OA econ switch setpoint

Rooftop Units

Description	Points
RTU 1 RTU 2 RTU 3 RTU 4	Master OAT, Zone temps (6), Zone temp setpoints (6), Warmest zone temp, Coldest zone temp, Econ damper, MAT, RA CO2, Cooling stage 1, Cooling stage 2, Cold deck temp, Hot deck temp, Hot gas reheat valve command, Heating valve, DA DSP, DA DSP setpoint, Occ/Unocc, Supply airflow, SF status, SF VFD speed, Return airflow, RF status,

Points on BAS Cont'd

Rooftop Units Cont'd

Description	Points
RTU 5	Master OAT, Zone temp, Warmest zone temp, Coldest zone temp, Econ damper, MAT, CDT, CDT setpoint, Cooling stage 1, Cooling stage 2, HDT, HDT setpoint, Heating valve, SF status, SF VFD speed, Supply airflow, RF status, Return airflow, Occ/Unoc, Space static pressure, RA CO2, OA damper min position, DA DSP setpoint, Zone temps (6), Zone temp setpoints (6), Zone CD damper (6), Zone HD damper (6)
Daycare/ Cosmo RTU	Occ/Unocc, Heating temp setpoint, DAT setpoint, Cooling command, Cooling temp setpoint, DAT, OA damper control, Heating valve, OA damper min position, OAT, SF status, Cosmetology room temp
1985 Add RTU	Master OAT, Zone temp (2), RAT, RA cooling setpoint, MAT, Econ damper, Cooling stage 1, Cooling stage 2, Cooling coil DAT, DA DSP, DA DSP setpoint, Heating coil DAT, Heating valve, Zone heating temp setpoint, Heating enable, Occ/Unocc, SF status, SF VFD speed, RF status

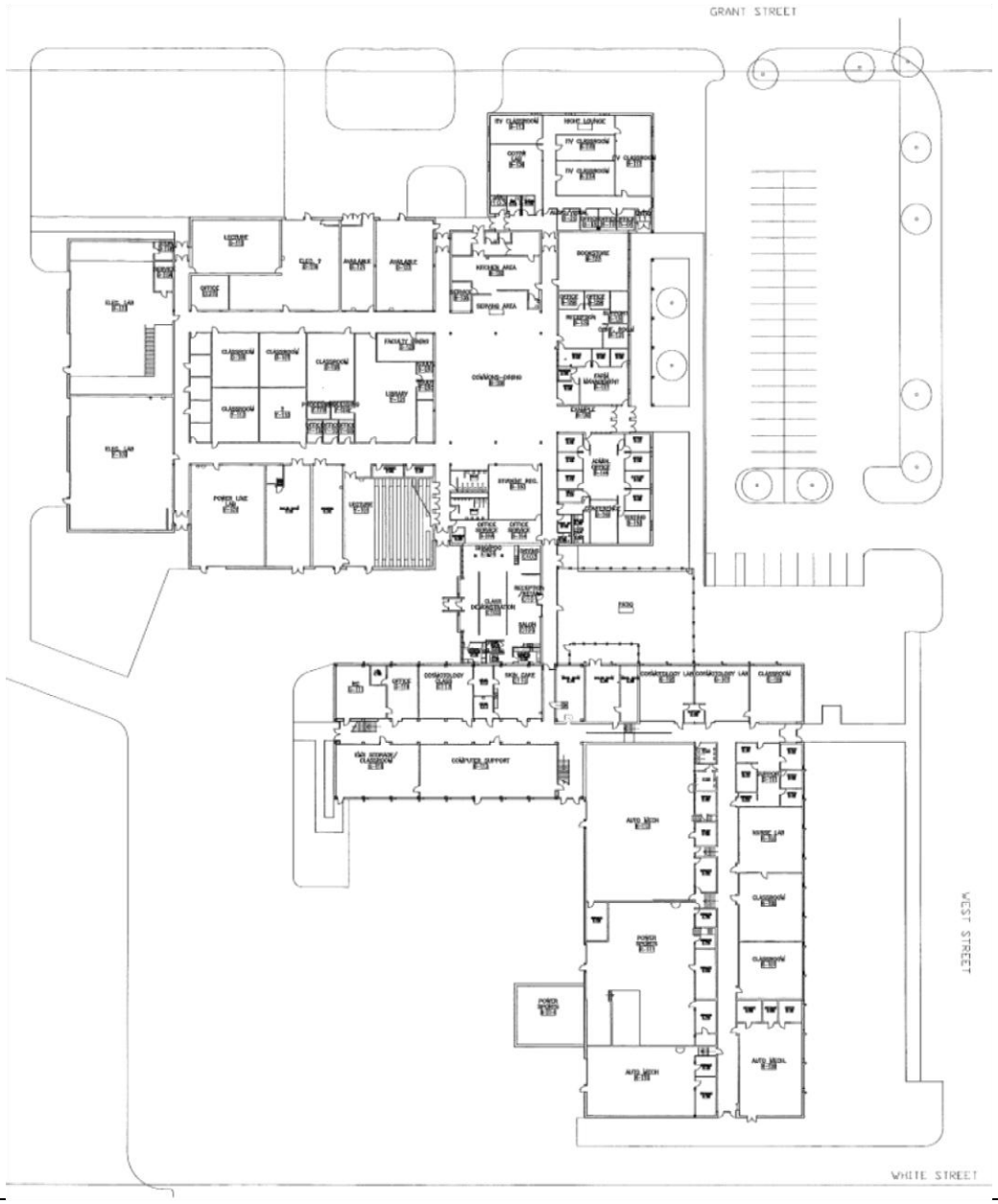
Heating Ventilators

Description	Points
HV 1-7	Command

Heating System

Description	Points
1964 Heating System	Standby water temp (2), Common header steam press, Boiler % modulation (2), Boiler status (2)
1974 Heating System	HW converter temp, Standby water temp (2), Boiler modulation (2), Steam setpoint, Condensate temp, OA setpoint, Boiler status (2), Common header steam press, Boiler lead-lag, Heating pump status (2)
1985 Heating System	OAT, HWST, HWS pressure, Converter valve, HW pump status

Campus Map



PBEEEP Abbreviation Descriptions			
AHU	Air Handling Unit	hp	Horsepower
BAS	Building Automation System	HRU	Heat Recovery Unit
CD	Cold Deck	HW	Hot Water
CDW	Condenser Water	HWDP	Hot Water Differential Pressure
CDWRT	Condenser Water Return Temperature	HWP	Hot Water Pump
CDWST	Condenser Water Supply Temperature	HWRT	Hot Water Return Temperature
cfm	Cubic Feet per Minute	HWST	Hot Water Supply Temperature
CHW	Chilled Water	HX	Heat Exchanger
CHWRT	Chilled Water Return Temperature	kW	Kilowatt
CHWDP	Chilled Water Differential Pressure	kWh	Kilowatt-hour
CHWP	Chilled Water Pump	MA	Mixed Air
CHWST	Chilled Water Supply Temperature	MA Enth	Mixed Air Enthalpy
CRAC	Computer Room Air Conditioner	MARH	Mixed Air Relative Humidity
CV	Constant Volume	MAT	Mixed Air Temperature
DA	Discharge Air	MAU	Make-up Air Unit
DA Enth	Discharge Air Enthalpy	OA	Outside Air
DARH	Discharge Air Relative Humidity	OA Enth	Outside Air Enthalpy
DAT	Discharge Air Temperature	OARH	Outside Air Relative Humidity
DDC	Direct Digital Control	OAT	Outside Air Temperature
DP	Differential Pressure	Occ	Occupied
DSP	Duct Static Pressure	PTAC	Packaged Terminal Air Conditioner
DX	Direct Expansion	RA	Return Air
EA	Exhaust Air	RA Enth	Return Air Enthalpy
EAT	Exhaust Air Temperature	RARH	Return Air Relative Humidity
Econ	Economizer	RAT	Return Air Temperature
EF	Exhaust Fan	RF	Return Fan
Enth	Enthalpy	RH	Relative Humidity
ERU	Energy Recovery Unit	RTU	Rooftop Unit
FCU	Fan Coil Unit	SF	Supply Fan
FPVAV	Fan Powered VAV	Unocc	Unoccupied
FTR	Fin Tube Radiation	VAV	Variable Air Volume
GPM	Gallons per Minute	VFD	Variable Frequency Drive
HD	Hot Deck	VIGV	Variable Inlet Guide Vanes

Conversions
1 kWh = 3.412 kBtu
1 Therm = 100 kBtu
1 kBtu/hr = 1 MBH